



United States General Accounting Office
Report to the Honorable
James V. Hansen, House of
Representatives

December 1995

DEPOT MAINTENANCE

The Navy's Decision to Stop F/A-18 Repairs at Ogden Air Logistics Center



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National Security and
International Affairs Division

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December 15, 1995

The Honorable James V. Hansen
House of Representatives

Dear Mr. Hansen:

As you requested, we reviewed the Navy's analysis to support its December 1994 decision to move F/A-18 depot maintenance work from the Air Force Ogden Air Logistics Center, Ogden, Utah, to the North Island Naval Aviation Depot, San Diego, California. This report addresses (1) our review of the Navy's analysis and adjustments for cost and performance comparability used to justify the decision to move its F/A-18 repair activities from Ogden to North Island, (2) our independent analysis using more current data than that available at the time of the Navy's decision, and (3) our analysis of the adequacy of guidance regarding the conduct of a merit-based analysis.

Background

The F/A-18 is a modern, first-line fighter and attack aircraft used by both the Navy and the Marine Corps. Each F/A-18 is periodically inspected to determine whether it needs to be sent to a depot for maintenance and repairs that cannot be performed at the squadron level. The depot maintenance specification for the F/A-18 is called the Modification, Corrosion, and Paint Program (MCAPP) and consists of inspections to identify needed repairs, the actual repairs, and the incorporation of needed aircraft modifications. Prior to fiscal year 1994, the Navy assigned all F/A-18 MCAPP work to the North Island depot.

In an effort to minimize costs, the Navy decided in 1992 to subject its F/A-18 MCAPP maintenance to public/private competition. The competition package consisted of an expected quantity of 72 MCAPPs with minimum and maximum quantities of 36 and 90 MCAPPs in the first year, and options to continue the contract for up to 4 additional years. The minimum, maximum, and expected quantities were lower for each successive option year, and the estimated value of the contract if all options were exercised was about \$61 million.

North Island, Ogden, and two private contractors submitted bids. Ogden's was substantially lower than the others and the Navy cost-evaluation team generally found the bid to be well-supported. Ogden was awarded the contract on August 24, 1993, and started work on the first F/A-18 MCAPP on

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December 8, 1993. The Air Force subsequently was informed that it would only get 36 MCAPPS, the minimum number in the competition package, because the Navy wanted to maintain core capability at North Island.¹ Although the Air Force attempted to have Ogden assigned as the source of repair designation for the F/A-18, the Navy, with the Office of the Secretary of Defense (OSD) approval, continued to maintain F/A-18 aircraft maintenance at North Island. Thus, the MCAPP workload was split between the Navy depot and the Air Force depot. Between August 1993, when Ogden was awarded the F/A-18 contract, and November 1994, when the last F/A-18 was inducted at Ogden, North Island inducted 34 F/A-18s and Ogden 36. Navy core analysis data indicates the core capability for the F/A-18 is 18 aircraft.

Following the competition, the Navy reengineered its work processes at North Island and reduced its cost of the F/A-18 repair work. In September 1994, the Navy began evaluating whether to exercise its option for the second year of the F/A-18 contract. North Island submitted a proposal to give it the F/A-18 workload that otherwise would have continued at Ogden. Since the Navy was planning to add additional maintenance requirements to the MCAPP repair specification, the contracting officer asked Ogden to provide a bid for the additional work. According to Ogden officials, they were not told that this bid was to support a competitive comparison with North Island.

Title 10 U.S.C. 2469 requires DOD to use competitive, merit-based procedures before depot-level work valued at \$3 million or more can be moved from one DOD depot to another or from a DOD depot to the private sector. In response to this requirement the Navy, in December 1994, prepared an analysis that compared the estimated quality, schedule, and cost of MCAPP work at Ogden and North Island. The Navy concluded that quality was the same at both activities but that North Island could perform the work in fewer days and at less cost to the government. As a result, the Navy decided not to exercise its option for the second year at Ogden, but rather to consolidate all F/A-18 MCAPP work at North Island.

¹Depot maintenance core capability is generally to be maintained within the Department of Defense (DOD) depots to meet readiness and sustainability requirements of weapon systems and equipment that are critical to mission performance to support the Joint Chiefs of Staff approved combat contingency scenarios. The services designate certain weapon systems, equipment, and components as mission essential for support of Joint Chief of Staff-approved contingency plans. Depot maintenance for these mission-essential weapon systems and equipment will be the primary workloads used to support required core depot maintenance capabilities. Core is said to be defined not by individual service but for DOD as a whole. However, in practice it appears each service will be allowed to define a core capability requirement for its own essential systems and equipment, even though they may be very similar to systems and equipment maintenance capability maintained in another service.

Results in Brief

Comparing F/A-18 MCAPP cost and performance at North Island and Ogden depots was complicated because a number of data judgments and adjustments were required. The Navy's analysis did not always use the most current and complete information available and did not make adjustments for all known differences in work completed at each depot. Our analysis, using more current and complete information, showed that Ogden's costs were slightly lower. Nevertheless, given DOD's decision to retain F/A-18 repair capability at the Navy's North Island facility, it appears consolidation of the workload at that location is the most cost-effective approach.

There is no clear statutory or DOD guidance that defines the steps, processes, analyses, and validation procedures required for a merit-based selection process. Such guidance is needed if DOD intends to base future depot maintenance workload allocation decisions on such merit-based analyses.

Navy Adjustments for Comparability

The Navy's decision to consolidate F/A-18 work was based on its analysis of F/A-18 MCAPP schedule and cost differences between Ogden and North Island. In evaluating schedule differences, the Navy compared the estimated days required by each activity to complete an MCAPP. In evaluating cost differences, it compared the estimated total cost to the government for each activity to complete an MCAPP by estimating the labor hours, the labor-hour rate, and the resulting total cost at each activity. The cost analysis included labor and overhead costs but excluded direct material costs, which the Navy stated should be the same at both activities. The cost analysis also excluded airframe modification costs performed concurrently with MCAPP work because modifications vary considerably from airframe to airframe.

Details of the Navy's December 1994 analysis, including the adjustments made to Ogden and North Island data, follow. Also, appendix II summarizes the cost comparison made by the Navy.

Schedule Comparison

The Navy attempts to minimize the time each aircraft is out of service for depot maintenance because of readiness concerns and to help minimize the number of aircraft required for the maintenance pipeline. In its comparison of the time Ogden and North Island took to complete an F/A-18 MCAPP, the Navy used the number of repair days bid by each activity. Ogden had bid 143 days to complete an MCAPP II and North Island

110 days. Based on this comparison, the Navy concluded that North Island could complete an MCAPP in less time than Ogden.

The Navy made no adjustments to the repair days bid by each depot. However, it noted that Ogden's average repair days on completed F/A-18s were greater than its bid while North Island's average repair days were less than its bid. Ogden delivered only the first aircraft ahead of schedule, with the next 15 delivered between 17 to 217 days late. Ogden officials estimated that the remaining 20 aircraft would be delivered between 35 to 298 days late. Navy officials acknowledged that the Navy caused some Ogden schedule delays through such actions as late delivery of parts and late approval of funding, but did not quantify the extent of these delays.

In its review of North Island production, the Navy developed turnaround data for North Island using only the last six F/A-18 MCAPPS. This data supported a turnaround time of 107 days for those aircraft. However, a review of production schedules for all F/A-18 MCAPPS completed at North Island during fiscal year 1994 revealed that the average turnaround time over that period was 269 days—almost 2-1/2 times longer than the 110-day bid submitted by North Island. Navy officials noted that process improvements at North Island had significantly reduced the F/A-18 turnaround time, and this improvement was demonstrated by the production turnaround time achieved for the six MCAPPS used as a basis for the Navy analysis.

While Ogden's production turnaround time was also significantly longer than its bid supported, Ogden officials gave us data showing that the depot's late delivery of 15 of the first 16 aircraft was caused primarily by a number of Navy actions. Air Force officials cited approval of engineering repair proposals as the most frequent reason for work delays. For repairs not covered by maintenance manuals provided the Air Force, Ogden's engineers must design and submit for approval proposed repairs under the Rapid Response Repair (3R) System to the F/A-18s Cognizant Field Activity at the North Island Naval Aviation Depot. This approval is required before proposed repairs can be made. Ogden officials reported that work delays occurred because it often took several weeks to obtain required technical information from the Navy's Cognizant Field Activity before a repair could be designed and once designed, it took too long to get Navy approval. Usually proposed repairs had to be submitted multiple times before being approved.

Data provided by Ogden showed that they had experienced delays of 11 to 90 days in obtaining 3R approval on 18 of the 36 aircraft inducted as of March 1995. North Island officials said that the time they took to respond—but not necessarily approve—Ogden's 3R requests met or was less than the time called for in the contract and that the average response time was 2.7 days. They also noted that the response time in support of Ogden was better than the response time required to process 3Rs for the North Island depot. We noted that 3R response times do not reflect the time required to obtain the technical data needed to prepare the proposal or the number of times the proposal is resubmitted before being approved.

Late funding by the Navy was the second most frequent reason Ogden cited for work delays. Before applying an engineering modification called for by the contract, the Navy F/A-18 program office had to approve the expenditure of procurement funds for this purpose. According to Ogden officials, work on 28 of the 36 aircraft was delayed from 5 to 259 days because of late funding. F/A-18 Program Office officials stated that late funding was a problem caused by an archaic funding system. This funding system was not used for similar work by the Navy's North Island depot.

Data provided by the Air Force indicated that late receipt of replacement parts was the third most significant cause of work delays at Ogden. Contractually, Ogden must obtain replacement parts from the Navy supply system; however, the system was frequently unable to provide items when Ogden needed them. Aircraft processing records show that 17 of 36 aircraft experienced work delays because replacement parts were not available from the Navy supply system when needed. Delays caused by late replacement parts ranged from 2 to 52 days. Navy officials acknowledged that F/A-18 spare parts shortages are a Navy-wide problem, but they said that since North Island is the approved overhaul depot for F/A-18 components, parts shortages had less of an impact on North Island's F/A-18 delivery schedule. Ogden officials noted that they had the capability to repair some of the parts had they been allowed to do so.

Ogden incurred other significant delays because the Navy required the reinspection of certain aircraft using a procedure that included the removal of wings from some completed aircraft. Nine aircraft were delayed from 14 to 30 days—a total of 211 days—because the Navy required Ogden to remove the wings and reinspect the wing attach lugs for possible damage, after an Ogden crew used an unapproved mechanical process to remove an anticorrosive compound from the wing lugs on one of the earlier aircraft. Reinspection of the aircraft in question did not find

damage. All measurements were within the specifications outlined by the Navy for surface roughness and lug thickness. Three other aircraft that had been worked on by the crew using the unapproved procedure were also reinspected and showed no evidence that an unauthorized machine process had been used or that the wing lugs were out of tolerance. Although no damage was found, the Navy required Ogden to inspect five additional aircraft, even though these aircraft had not been worked on by the same crew. These inspections produced no evidence of the unauthorized machine process and only one out-of-tolerance condition concerning surface roughness. The cause of that discrepancy, a small scratch, could not be determined by either the Navy or Ogden. Air Force and Defense Contract Management Command (DCMC) officials questioned the need to require the removal of wings on completed aircraft. The Navy believes that requiring Ogden to remove the wings and reinspect the lugs was justified because the area involved was a flight critical structure from an aircraft safety standpoint.

According to Ogden officials, various work delays caused by the Navy prompted over 100 letters to the Navy contracting officer asking for corrective action on various problems causing the delays and also asking for schedule extensions resulting from prior delays. The Navy contracting officer did not respond to any of the letters, and only after the F/A-18 MCAPP contract was terminated did it allow the DCMC to act on Ogden requests for schedule extensions. According to DCMC officials, on other programs they are routinely allowed to modify schedule delivery dates when conditions are appropriate. These officials noted that a private contractor may have stopped work.

Ogden officials attempted to analyze the collective impact of various delays on the depot's ability to repair aircraft. They noted that various delays were ongoing concurrently, but their analysis revealed that one aircraft experienced delays attributed to the Navy totaling 546 days. Noting that they overlapped for the various conditions, Air Force officials concluded that work was delayed 82 days while 6 3Rs were being processed, 259 days because funding was approved late, and 205 days for other reasons such as late receipt of replacement parts and a faulty engineering repair solution. Navy officials dispute that delays were caused by the length of 3R processing times and noted that delays due to the lack of spare parts in critical supply were also experienced across the entire Navy.

Labor Hour Comparison

The Navy's first step in analyzing F/A-18 MCAPP costs at Ogden and North Island was to compare MCAPP labor-hour requirements. However, for several reasons making such a comparison is difficult. First, the two activities used different MCAPP repair specifications, which affect the labor hours required to perform the work. After the competitive contract was awarded to Ogden, the F/A-18 repair specification was changed to incorporate additional inspection requirements. The extra inspections normally identify additional repair tasks, which also require more labor hours to complete. North Island has used the revised repair specification, called MCAPP II, since May 1994, while Ogden had continued to use the original MCAPP specification as called for by the terms of the contract. We noted that during fiscal year 1994, the Navy completed 82 MCAPPs using the same specification as that used by Ogden and that the labor hours required to complete these aircraft averaged 7,299 labor hours. F/A-18s inducted at North Island after December 18, 1993, the date when the first Ogden F/A-18 was inducted, averaged 6,819 labor hours. Navy officials stated that process improvements to reduce the labor hours required at North Island to complete an F/A-18 MCAPP had only been completed in time to fully benefit F/A-18 MCAPP II aircraft, which were first inducted in April 1994. We determined that although the MCAPP II specification was expected to require more labor hours than MCAPP I, the average labor hours for the 6 MCAPP II aircraft completed before the time of the Navy's analysis was 5,684—a significant reduction over the historical average time required for MCAPP Is at North Island. The Navy attributed these labor-hour reductions to increased efficiencies at the North Island depot—primarily because it reduced the number of components that were overhauled concurrently with the MCAPP.

Second, differences in the number of carrier-based and land-based F/A-18s repaired also complicate a labor-hour comparison by each activity. Navy officials stated that this comparison is important because the F/A-18 repair specification makes a distinction between carrier-based and land-based F/A-18s. Specifically, the repair specification requires more inspections for carrier-based F/A-18s because they normally are subjected to a harsher environment and more physical stress due to salt water, catapult launches, and arrested landings. According to the Navy, the additional inspections normally result in more repair work. At the time of the Navy's analysis, North Island had recently completed six carrier-based F/A-18s while Ogden had completed two carrier-based and five land-based F/A-18s. The Navy did not use data from the carrier-based aircraft repaired at Ogden.

Third, differences in F/A-18 component repair procedures at each activity also complicate a labor-hour comparison between the two activities. Under terms of the Ogden contract, most components requiring repair are to be exchanged for replacement components provided by the Navy for installation on the aircraft. At North Island, many components requiring repair are to be repaired concurrently with the aircraft and then reinstalled on the aircraft. The additional labor hours used by North Island for component repairs are included in the total labor hours charged to each aircraft. North Island officials told us that the biggest factor influencing its process improvement was that the depot significantly reduced the number of components that were overhauled concurrently with MCAPP. Rather than routinely overhauling components that had been removed from aircraft being inducted for an MCAPP, revised procedures called for only overhauling components if they did not meet technical requirements.

Fourth, there are differences in the amount of work required on each aircraft. Each aircraft is unique and the amount of needed repairs identified during the inspections varies considerably from aircraft to aircraft. The use of averages tends to normalize these variations in work content. However, the averages used in the Navy's analysis were based on small quantities of completed aircraft at both depots. As a result, the averages may not have normalized labor-hour differences caused by differences in the repairs required on each aircraft. This problem probably affected analysis of the Ogden hours even more than North Island since Ogden had not advanced far enough along in the F/A-18 repair program to reach a normalized production level.

Finally, there are other differences between the activities that affect labor hours used for MCAPP work that also complicate a labor-hour comparison. For example, there are differences in (1) the cost accounting systems used to collect labor-hour expenditures, (2) operation and administration procedures for work performed, and (3) the numbers of F/A-18 MCAPPs completed in the past that affects the comparability of performance data and the potential for future improvement.

Adjustments to Ogden's Labor Hours

The Navy made several adjustments to the historical data used in its analysis. Through the adjustments, the Navy estimated the labor hours required by each depot to perform an MCAPP II on a land-based F/A-18 with no concurrent repair of components. These adjustments increased Ogden's labor hours and reduced North Island's labor hours below Ogden's. The Navy did not make adjustments to account for known factors

causing labor-hour increases at Ogden, such as delays caused by the nonavailability of parts, time awaiting approval of proposed maintenance actions, a Navy required wing removal and reinspection, front-end training time, or increases due to the type of contract administration used for the Ogden repair work. The Navy also did not recognize Ogden's potential for reducing labor hours as additional aircraft were produced or consider basing its land-based versus carrier-based analysis on Ogden aircraft results rather than North Island's even though Ogden had produced both types.

As the starting point for Ogden, the analysis used the 3,069 average labor hours approved for payment by the contract administrator for the 5 land-based F/A-18s completed by Ogden at the time of the analysis. Actual labor-hour expenditures at Ogden were not used because the work at Ogden was being administered similar to a contract with a private company. As a result, the Navy said it only had access to the labor hours approved for payment by the contract administrator.

The Navy made three adjustments to the Ogden average. First, the contract administrator had made a decision in November 1994 to approve 12 to 17 percent additional labor hours for personal, fatigue, and delay time associated with certain work at Ogden. Based on this decision, the Navy adjusted some of Ogden's proposed labor hours using a 12-percent factor, which added 153 hours. In January 1995, Ogden formally requested approval for compensation for additional hours to reflect personal fatigue, and delay time using a 16.7-percent factor.

The Navy made a second adjustment to add the labor hours required for the additional MCAPP II inspection requirements. In September 1994, the Navy asked Ogden to submit a bid for these additional requirements, and in response, Ogden submitted a proposal for 228 additional labor hours. Based on this proposal, the Navy added 228 hours to Ogden's labor-hour estimate.

The third adjustment made to Ogden's labor hours added 480 hours estimated for the additional repair work that would result from the additional MCAPP II inspections. When Ogden bid the 228 hours for MCAPP II inspections, the activity did not submit a bid for the needed repair work that would be identified during the inspections. The F/A-18 field engineering activity that developed the MCAPP II specification estimated that 3 labor hours of repair work would result from each additional inspection hour. Use of this ratio would have added 864 labor hours to the

Ogden average. Navy officials stated that to be conservative in making this adjustment, they used a ratio of 2.1 repair hours for each inspection hour. This ratio was based on the approved labor hours for inspections and the resulting repair work on Ogden's five completed land-based F/A-18s.

While the second and third adjustments appear logical, we could not determine whether Ogden would have needed all of the additional time related to these adjustments. As previously discussed, North Island reduced both its turnaround time and labor hours for MCAPP II aircraft. We did not analyze the two specifications to determine if there were changes that might have reduced the production time at Ogden as it had of North Island.

The Navy, as previously noted, did not adjust Ogden's hours to reflect improved performance normally expected from the learning curve as a depot gains experience with a new workload. DCAA officials told us learning curve analyses are routine in their normal bid proposal evaluations. Learning curve theory states that, for repetitive tasks, as quantities double, the time to perform a task reduces at relatively constant percentages. Over time, the quantities required to reach a doubling can become very large, causing an apparent significant slowing of the rate of learning. On the F/A-18 MCAPP, North Island would have already experienced a significant amount of learning due to the quantities performed. Ogden, on the other hand, having just begun the program should have been expected to experience significant learning (decreases in hours) if the program had continued. According to DCAA officials, in projecting future labor-hour requirements at Ogden, use of a learning curve would have been appropriate since Ogden's hours for its first few aircraft were being compared with those of North Island, which already had many years performance experience. Navy officials stated that the data on approved labor hours provided by DCMC provided no indication of a learning curve because so few aircraft had been completed.

Adjustments to North Island's Labor Hours

As the starting point for North Island, the Navy used the 5,684 average labor hours expended on the last 6 completed F/A-18s at North Island. All six F/A-18s were carrier-based aircraft, and all were repaired using the MCAPP II specification.

The labor-hour average for these aircraft represents a significant decrease in the historical labor hours expended by North Island for MCAPP work. For example, in fiscal year 1994, North Island completed 82 MCAPPs at an

average of 7,299 labor hours. The 5,684 labor-hour average for the last 6 completed aircraft represents an average decrease of 1,618 labor hours, or 22 percent less than each completed MCAPP I, even though the MCAPP II specifications require additional hours for inspection and repairs.

North Island officials attributed labor-hour reductions to process improvements identified as a result of the public-private competition for F/A-18 MCAPPS. After the competition, North Island made a detailed review of its F/A-18 repair operations with a view to reducing costs, including visits to Ogden to review that depot's processes and procedures. Although North Island lost the competition, the changes were incorporated into the depot's operations for the F/A-18 core aircraft that were not included in the competition package. Changes that reduced labor and processing time included establishing central approval authority for recommended repair tasks, conducting daily progress meetings between the managers and artisans at the site of each aircraft in the plant, reducing component repair time by only repairing the items needed for safe operation instead of completely overhauling the entire component, and moving work crews to each aircraft as work progressed instead of physically moving the aircraft to different work stations. North Island data indicated that repair costs for the six MCAPPS used as a basis for the Navy's analysis were 37 percent below previous F/A-18 MCAPP costs at this depot.

The Navy made 2 adjustments to the North Island 5,684 labor-hour average. First, it reduced the average by 493 hours to account for the labor hours used to repair components. Ogden replaces broken components but does not repair them. The adjustment was less than the average labor hours historically used for component repairs. However, the Navy stated that North Island adopted new repair practices that reduced component repairs. We noted that the Ogden labor hours included some off-equipment component repair work, but these hours were not separately identified for purposes of the Navy analysis. Navy officials said they do not classify this work as depot-level repair; furthermore, they noted that Ogden had not been approved by the Navy to do any depot-level component rework.

The second adjustment was made because Ogden's five aircraft used in the comparison were land-based and North Island's six aircraft were carrier-based. The Navy stated that historical data at North Island showed that land-based F/A-18 MCAPPS on average require 27.5 percent fewer labor hours than carrier-based F/A-18s because of fewer corrosion and structure problems. To estimate the labor hours that North Island would have used if all aircraft had been land-based, the Navy reduced the average by

27.5 percent, or 1,430 labor hours. To differentiate between land-based and carrier-based aircraft, the Navy used as a measure the number of catapult launches. Aircraft with at least 200 catapult launches were said to be carrier-based and those with less were said to be land-based.

We identified several factors that would question the appropriateness of the Navy's large reduction of North Island labor hours based upon its carrier- versus land-based analysis. For example, Ogden was operating under different instructions from the Navy regarding how to define a carrier-based aircraft. Thus, Ogden incurred additional labor hours for inspections using criteria defined in the MCAPP inspection procedures even though the aircraft would not have qualified as a carrier-based aircraft using the 200 catapult launch criteria. Additionally, the 27.5-percent reduction was not well-supported based on an analysis of North Island data. We also noted that at the time the Navy collected data for its analysis, Ogden had already repaired several aircraft that had over 200 catapult launches. The Ogden data showed a 7-percent increase in hours for carrier-based aircraft. Further, in isolating the relative influence of various factors on the number of labor hours required to perform an MCAPP, we found that other factors such as number of flying hours and time since previous major repair appeared to be much more statistically meaningful indicators of how many hours would be required to conduct an MCAPP.

The Navy did not ask DCAA to review the proposed labor hours or to determine if its adjustments to those hours were supported. Navy officials noted that this was consistent with the process used in the original competition in which DCAA assessed rates and Naval Air Systems Command assessed labor hours. However, we noted that DCAA's audit reports of Ogden and North Island's original bids included evaluations of both rates and hours. DCAA was responsible for ensuring that bids prepared by public depots included all relevant costs.

Rate Adjustments

With labor-hour estimates determined, the Navy then estimated the rates, or cost per hour, to perform MCAPP work at Ogden and at North Island. To do this, the Navy asked DCAA to review actual F/A-18 costs at both depots and estimate actual rates for fiscal year 1995 work. The Navy requested DCAA to complete its review and report the results in less than 1 week. Although DCAA complied with the request, the resulting reports were highly qualified. DCAA reported that its review was limited to verifying reported actual cost information and making an estimate of actual costs for the next

year. DCAA reported that it did not have sufficient time to perform the procedures necessary to comply with generally accepted government auditing standards. DCAA officials stated that in at least one case their analysis was based on incomplete data.

DCAA initially reported that Ogden's expected actual hourly rate for fiscal year 1995 for F/A-18 MCAPP work was \$81.00. After considering additional information provided by Ogden officials, DCAA revised its estimate to \$68.83. In its analysis, the Navy used the \$68.83 rate for Ogden with no adjustments. DCAA officials later reported that the Ogden rate should have been \$61.68. They stated that the initial rate estimate did not fully discount the impacts of first-year training and the Navy requirement to perform wing removals and reinspection on several aircraft.

DCAA reported that North Island's expected actual hourly rate for fiscal year 1995 for F/A-18 MCAPP work was \$67.89. In its analysis, the Navy made several adjustments that reduced the DCAA estimated rate to \$62.86, a \$5.03 reduction. Navy officials stated that most of the reduction was made to provide for differences between Ogden and North Island in the accounting of certain F/A-18 material costs. Under the contract, some F/A-18 material is provided to Ogden at no cost as government-furnished material. This same material is included in North Island's costs. The adjustments account for these differences as well as for a minor error in the accounting for building depreciation at North Island.

In estimating rates at Ogden and North Island, the Navy did not fully adjust for extra costs Ogden incurred from: (1) operating under DCMC contract administration rather than a less costly interservice support agreement, (2) first-year training because the F/A-18 workload was new, (3) Navy delays in providing spare parts and approving maintenance procedures, or (4) conducting the Navy-required wing removal and reinspection procedure on several aircraft that revealed no quality problems. Navy officials stated that (1) despite the higher cost under DCMC contract management, they had a contract with Ogden that required the use of DCMC contract administrators; (2) adjustments for first-year training and reinspection costs were included in the \$68.83 qualified rate estimate provided by DCAA; and (3) Ogden did not incur increased labor cost while awaiting spare parts and that repair approval procedures were timely.

Total Cost Comparison

To arrive at the estimated cost to the government for MCAPP work at Ogden, the Navy multiplied Ogden's adjusted average labor hours by the

DCAA rate. The result was \$270,502. The Navy added \$9,000 to account for MCAPP II equipment that the Navy said Ogden would need to perform MCAPP II inspections. The \$9,000 was calculated by dividing the \$207,000 cost of the machinery by the minimum 23 F/A-18 MCAPP IIs that would be performed in fiscal year 1995. For North Island, the Navy multiplied North Island's adjusted average labor hours by the adjusted DCAA rate. The result was \$236,416, or \$34,086 less than Ogden.

Other Cost Considerations When F/A-18 Workload Is Dual-Cited

Although the Navy's decision to move F/A-18 MCAPP work from Ogden to North Island was based primarily on the cost and schedule differences discussed above, the Navy analysis also noted other costs associated with having MCAPP work performed at two locations. The Navy, with DOD concurrence, is requiring that F/A-18 core repair capability be maintained at a Navy depot. Thus, when Ogden won the F/A-18 competition, the Navy did not send all F/A-18 MCAPPs to the Air Force depot. Instead, North Island performed about half of the MCAPPs to maintain a Navy core capability to repair the aircraft.

The Navy identified six factors associated with performing F/A-18 work at two depots that increase the total cost of the work. The Navy estimated that these factors add \$43,000 to the government's cost for each F/A-18 MCAPP accomplished at Ogden. According to the Navy, the additional costs are eliminated by consolidating all F/A-18 MCAPP work at one site.

We agree there are additional costs to the government when the same work is performed at two depots. As a result of its recognition of the advantages of single-siting depot maintenance workload, in recent years DOD has single-sited numerous depot maintenance workloads that had previously been split among two or more depot activities. Nonetheless, our review indicated that quantifying these costs is difficult, and in most cases, the Navy overestimated the amounts. The six cost factors identified in the Navy's analysis are discussed below.

- The Navy estimated that the difference in the days required to complete MCAPP work at Ogden and North Island would cost the government \$11,000 in additional depreciation costs for each MCAPP performed by Ogden. This amount was based on Ogden's bid of 143 days to perform an MCAPP and North Island's bid of 110 days. As discussed earlier, we believe the Navy's use of this factor was inappropriate. North Island's bid reflected a substantial reduction from its yearly average and assumed that recent reductions in turnaround times would be maintained. Ogden's bid, on the

other hand, reflected delays and other factors experienced during its first year that should have been reduced or eliminated in subsequent years.

- The Navy estimated that engineering support costs provided to Ogden added \$8,000 to the cost of each MCAPP. However, this is not an additional cost since similar engineering support is required regardless of where the repair work is performed.
- The Navy estimated that \$1,600 in added costs per MCAPP resulted from the Navy having an on-site representative at Ogden to help oversee and monitor work. We noted that the Navy elected to have an on-site representative at Ogden, even though the contract did not require one. Also, it is not clear that all costs associated with this function were added costs to the government since the on-site representatives were from the North Island cognizant field activity and were assigned F/A-18 work regardless of where the work was performed. Travel and per-diem costs were, however, attributable to the Ogden contract.
- The Navy estimated that the cost of having DCMC administer the contract at Ogden added \$15,700 to the cost of each MCAPP. While we did not verify these costs, we agree that if correct, the Navy's chosen method of contract administration at Ogden was costly. However, the Navy did not have to use DCMC to administer the contract at Ogden. The F/A-18 workload could have been administered at less cost through an interservice support agreement, as called for in the DOD Cost Comparability Handbook. Thus, it was inappropriate in this case to include the DCMC contract administration costs as a differential factor for purposes of the F/A-18 analysis.
- The Navy estimated that the additional material costs for the Aviation Supply Office to support MCAPP work at two locations was \$5,750 for each MCAPP completed by Ogden. We did not verify the Navy's estimate of the cost. However, we noted that the Air Force and the Navy were negotiating a no-cost contract modification that would have allowed Ogden to use the Air Force supply system for the option years. While Ogden would have had to continue to rely on the Aviation Supply Office for reparable components not available through the Air Force system, its reliance on the Navy system should have been significantly reduced.
- The Navy estimated that the additional cost to fly each F/A-18 from Ogden to North Island was \$1,090. We believe that this is not an additional cost because an aircraft should be flown from its squadron to the depot and back. Also, F/A-18s from East Coast locations would incur less costs by flying to Ogden rather than to North Island due to geographic differences.

Although we could not validate most of the Navy's estimates of specific costs associated with maintaining the F/A-18 workload at two different locations, we recognize that in recent years DOD has identified advantages

from eliminating redundancies in its depot maintenance workload capability and has consolidated many depot workloads formerly accomplished in multiple locations at a single site. In general, we have supported such consolidations.

Navy Analysis Understates North Island's MCAPP Labor Hours

The Navy made a 27.5-percent downward adjustment to North Island's labor hours based on limited sample data. Using more current and complete data would have significantly reduced the adjustment. Without this adjustment, the Navy's analysis would have shown North Island's costs to be higher than Ogden's.

To determine North Island's MCAPP labor hours, the Navy used North Island's recent experience performing MCAPP IIs on five carrier-based aircraft. These MCAPPS reflected significant labor-hour reductions from historical levels. Ogden's labor hours were based on its experience performing the original MCAPP work on five land-based aircraft. To adjust for any differences between land-based and carrier-based aircraft, the Navy compared labor hours on a sample of land- and carrier-based F/A-18 MCAPPS performed at North Island during the first 6 months of fiscal year 1994. The sampled MCAPPS were prior to process improvements at North Island that significantly reduced labor hours and prior to MCAPP II work. A comparison of labor-hour costs for all financially completed F/A-18 MCAPPS at North Island in fiscal year 1994 would have reduced the downward adjustment from 27.5 to 14 percent. Using a comparison of the last 6 months of fiscal year 1994, which reflects more of the current MCAPP II work, the downward adjustment would have been even less.

To test the basis for the large labor-hour adjustment for carrier-based aircraft, we analyzed the approved labor hours for completing MCAPPS at Ogden for both carrier-based and land-based aircraft. We noted there was only a 7-percent difference. To understand further the relationship between catapult launches and labor hours, we also performed a regression analysis, comparing North Island catapult launches and hours, to determine how much of the change in hours is explained by the change in catapult launches. The resulting correlation was approximately 9 percent. This means that only 9 percent of the change in hours is explained in catapult launches. In other words, 91 percent of the change in hours is related to factors other than number of catapult launches, such as number of flying hours and age of the aircraft.

We also performed an additional review of the hours and numbers of catapult launches. That analysis indicated that there is not a strong relationship between the number of catapult launches and the hours required for MCAPP work.

We recomputed the Navy's analysis using a 14-percent downward adjustment. As shown in appendix III, the recomputed Navy analysis shows Ogden's cost is \$272,900 and North Island's cost is \$275,900 for an F/A-18 MCAPP. Navy officials concurred with the analysis using a larger sample size provided the sample was based on all labor completed aircraft, not the more inclusive financially completed aircraft. The Navy officials commented that by using labor completed aircraft the downward adjustment would be 16.7 percent rather than 14 percent—making Ogden's cost slightly higher. However, since labor complete figures do not capture the final total labor hours that are included in financially complete figures, the financially completed measure is more commonly used. Additionally, as previously noted, our analysis of Ogden's labor-hour differential between carrier-based and land-based aircraft showed only a 7-percent difference.

The Ogden total, shown in appendix III, included \$2,379 that the Navy added for equipment that Ogden would have to purchase for MCAPP II inspections. Navy officials stated that including the equipment cost was appropriate because the contract required the equipment for the performance of MCAPP II. Ogden officials stated that they did not believe the equipment adjustment was appropriate. They noted that similar equipment had been called for as part of the MCAPP I work. However, because of the infrequency of the repair requirement for components needing the equipment, the Navy had determined it to be more economical to send the parts to North Island rather than purchase the equipment for Ogden. It is not clear why this same procedure would not have been used for MCAPP II repairs at Ogden.

The recomputed Navy analysis in appendix III shows Ogden's cost was slightly less than North Island's. Further, if DCAA's revised labor rate of \$61.68 had been used, Ogden's per-aircraft cost would have been more than \$30,000 less per aircraft. Nonetheless, the decision may still have been made to move the workload back to North Island due to the Navy's assessment regarding potential cost savings from consolidation.

Comparison of Costs Using Current Information

We performed a separate analysis comparing estimated costs for performing MCAPP work at Ogden and North Island using (1) the most current data available at the time of our review in March 1995, (2) actual labor hours expended by Ogden and North Island for completed MCAPPS for carrier-based F/A-18s, and (3) actual rates at Ogden and North Island based on actual costs for completed F/A-18 MCAPPS. This analysis is summarized in appendix IV.

We adjusted North Island labor hours to account for the labor hours used for concurrent repair of components. We adjusted Ogden labor hours to estimate the additional labor hours required to perform MCAPP II work. Because we compared only carrier-based aircraft completed by each depot, we did not make an adjustment for differences in the proportion of carrier-based and land-based F/A-18s at each depot.

We made two estimates of the total cost to the government using the adjusted labor-hour estimates and two different rate estimates. The first estimate used the actual rate at each activity for F/A-18 MCAPPS completed in fiscal year 1995. The second estimate used the actual rate at each activity adjusted for differences in accounting for material costs, the cost of Ogden F/A-18 work that was outside of normal MCAPP requirements, and the additional cost of contract administration at Ogden in dealing with DCMC. Navy officials state that since Ogden's contract was structured with DCMC as the administrator, an adjustment is not necessary.

Using the actual rates, the analysis showed that the cost to the government for F/A-18 MCAPPS was less at North Island. Using the adjusted rates, the analysis showed that the cost was less at Ogden. We did not include in the analysis an estimate for the added costs to the government from having two depots perform F/A-18 work. Also, our analysis did not account for all differences in the work historically performed at the two depots because some differences cannot be accurately quantified.

Lack of DOD Guidance on What Procedures to Be Used

Title 10 U.S.C. 2469 contains provisions that restrict the movement of depot-level maintenance work from one depot to another or to the private sector if the value of the work is \$3 million dollars or more. The legislation requires that before such work is moved, the Secretary of Defense must ensure that the change is made using (1) merit-based selection procedures for competitions among all DOD depot-level activities or (2) competitive procedures for competitions among private and public sector entities.

Since the value of the F/A-18 MCAPP work moved from Ogden to North Island exceeded \$3 million, the decision was subject to the provisions of the legislation. In a December 20, 1994, letter, the Deputy Under Secretary of Defense for Logistics confirmed that he had reviewed the Navy's decision and supporting analysis. The letter stated that there were only two DOD depot maintenance activities capable of accomplishing the MCAPP work, Ogden and North Island, and that the Navy had performed a merit-based analysis and selection by evaluating proposals from these activities using quality, schedule, and cost criteria. The Deputy Under Secretary stated that the decision was based on the best value to the government and satisfied the requirements of section 2469.

Our review indicated that DOD has not developed guidance implementing the legislation that specifically defines the steps, processes, and analyses required for merit-based selection. In other words, the services do not have defined guidance on what they must do to ensure that decisions to move depot workload are based on merit-based selection procedures. Without such guidance, it appears that any selection decision using reasonable criteria and accurate data could be considered merit-based.

In the absence of guidance, the Navy established a process it believed was merit-based by using quality, schedule, and cost criteria in comparing F/A-18 MCAPP work at Ogden and North Island. However, our review indicated the Navy's implementation of that process had a number of shortcomings. For example, as we discussed previously, the Navy did not use the most current and complete data available in determining labor-hour differences between carrier- and land-based aircraft. Using more current and complete data significantly impacts the Navy's analysis. In addition, the Navy only allowed DCAA 1 week to determine the rates that were used in the cost comparison. DCAA qualified the information provided to the Navy at the time and subsequent DCAA analyses have resulted in different rate estimates. Further, the Navy analysis did not adjust for the extra costs incurred by Ogden in operating under DCMC contract administration even though the work could have been performed through an interservice support agreement at less cost.

The Deputy Under Secretary stated in the December letter that Ogden and North Island were the only activities considered in the selection decision because they were the only DOD activities capable of performing the F/A-18 MCAPP work. We would agree that at the time of the decision, Ogden and North Island were the only DOD activities performing F/A-18 MCAPP work. However, we question whether Ogden and North Island are the only DOD

activities capable of performing the work. Other Air Logistics Centers and Naval Aviation Depots routinely provide depot-level maintenance on several other types of fighter and attack aircraft. While these activities may not have all of the equipment and skills in place to start MCAPP work immediately, it would appear reasonable that with some preparation, other DOD activities could perform the work.

In view of the requirement to use merit-based selection procedures among all depot-level activities, other Air Logistics Centers, and Naval Aviation Depots could have been considered in the overall analysis. However, even if other activities had been considered, it is uncertain whether any would have submitted a proposal, and we recognize that start-up costs may have prevented other activities from being competitive.

Recommendation

We recommend that the Secretary of Defense develop and implement guidance on using merit-based selection procedures when moving depot workload as prescribed by title 10 U.S.C. 2469.

Agency Comments

We provided a draft of this report to DOD for comment. DOD provided official oral comments. OSD officials agreed with the report's overall conclusion that the F/A-18 MCAPP workload should be single-sited and also agreed with the recommendation. They stated that events discussed in this report demonstrate the difficulties created when one service's depot is pitted against another service's depot in a competitive environment. However, at the same time, they agreed that this case also demonstrates the potential cost savings that can be generated when competition motivates public depots to implement efficiencies by reengineering depot maintenance processes and workloads.

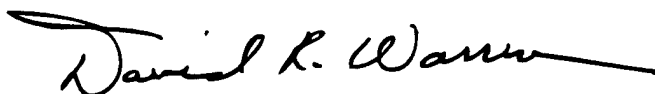
Air Force officials indicated overall concurrence with the report. Navy officials agreed with the overall conclusion that single siting all F/A-18 depot workload is in the best interest of the Navy. However, they raised concerns that the report did not accurately characterize the reasons why there were differences between their and our analyses. They stated that the Navy's analysis was based on the best information available at the time. We revised the report to reflect the Navy's concerns by more clearly explaining the reasons for the differences between their analyses and ours.

Appendix I describes our scope and methodology.

As arranged with your staff, unless you announce its contents earlier, we plan no further distribution of this report until 7 days from its issue date. At that time, we will send copies of this report to the Secretaries of Defense, the Air Force, and the Navy. Copies will also be made available to others on request.

Please contact me on (202) 512-8412 if you or your staff have any questions concerning this report. Major contributors to this report were Julia Denman, Gary Phillips, James Ellis, and Donald Lentz.

Sincerely yours,

A handwritten signature in black ink, reading "David R. Warren". The signature is fluid and cursive, with a long horizontal stroke at the end.

David R. Warren
Director, Defense Management
and NASA Issues

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Abbreviations

DCAA	Defense Contract Audit Agency
DCMC	Defense Contract Management Command
DOD	Department of Defense
MCAPP	Modification, Corrosion, and Paint Program
OSD	Office of the Secretary of Defense
3R	Rapid Response Repair System

Scope and Methodology

To address our objectives, we performed audit work at the activities involved with the decision to move F/A-18 Modification, Corrosion, and Paint Program work: the Naval Air Systems Command, Washington, D.C.; the Ogden Air Logistics Center, Ogden, Utah; the North Island Naval Aviation Depot, San Diego, California; and the Defense Contract Audit Agency, Salt Lake City, Utah, and San Diego, California. At each activity, we interviewed responsible agency officials and examined documents and other data related to the decision.

To identify the adjustments that were made to Ogden's and North Island's costs, we reviewed documentation supporting the Navy's cost analysis and discussed with Navy officials the reasons for and the methodology used for each adjustment. To determine whether the data used in the analysis was accurate and verifiable, we examined source documents supporting the data and performed independent analyses to assess the accuracy of the data and the adjustments made to the data. In preparing our separate cost analysis, we obtained the most current data available based on actual costs for completed work in fiscal year 1995 and made adjustments based on supportable differences in operations at Ogden and North Island.

In considering whether the decision to move the F/A-18 work was a merit-based decision as required by law, we reviewed the analysis supporting the Navy's decision in view of the language in section 2469 of title 10, U.S.C., as amended by section 338 of the fiscal year 1995 National Defense Authorization Act. We also discussed the matter with Navy officials.

Our examination and analyses used cost data reported by the Air Forces' Depot Maintenance Automated Data Systems and the Navy's Naval Air Systems Command Industrial Financial Management System. These standardized, automated cost accounting systems provide the official cost information for the services' depot operations. We did not make an independent assessment of the reliability of the data reported by these systems.

In addition, it should be noted that the Air Force and the Navy cost systems are not compatible. There are differences between the systems in the way costs are collected and accounted for. Although we made some adjustments in the data used, we cannot state with certainty that the data used, even with the adjustments, is directly comparable and consistent. Thus, the results of our analysis must be viewed with this limitation.

Appendix I
Scope and Methodology

Our review was conducted between January and August 1995 in accordance with generally accepted government auditing standards.

Navy's Original Analysis of Ogden and North Island F/A-18 Costs

	North Island			Ogden Air Logistics Center			Total cost difference	Less costly activity
	Labor hours	Rate	Total cost	Labor hours	Rate	Total cost		
North Island labor hours:								
Average actual hours for last six MCAPP IIs	5,684							
Adjustment for concurrent repairs (10.3%)	-493							
Adjustment for carrier-based (27.5% based on Navy estimate)	-1,430							
North Island rate:								
DCAA estimate of actual rate		\$67.89						
Adjustment for concurrent repairs and material provided to Ogden at no cost		-5.03						
Ogden labor hours:								
Average approved hours for five land-based aircraft				3,069				
Adjustment for personal, fatigue, and delay time				153				
Adjustment for added MCAPP II inspections (Ogden bid)				228				
Adjustment for MCAPP II over and above work (estimate)				480				
Ogden rate:								
DCAA estimate of actual rate					\$68.83			
Subtotal cost estimate	3,761	\$62.86	\$236,416	3,930	\$68.83	\$270,502	\$34,086	North Island
Adjustment for equipment for MCAPP II work at Ogden based on 1 contract option year						9,000		
Total	3,761	\$62.86	\$236,416	3,930	\$68.83	\$279,502	\$43,086	North Island

Navy Analysis With Corrected Data Available in December 1994

	North Island			Ogden Air Logistics Center			Total cost difference	Less costly activity
	Labor hours	Rate	Total cost	Labor hours	Rate	Total cost		
North Island labor hours:								
Average actual hours for last five MCAPP IIs ^a	5,587							
Adjustments for concurrent repairs (10.3%)	-483							
Adjustments for carrier-based (14% based on fiscal year 1994 data)	-715							
North Island rate:								
DCAA estimate of actual rate		\$67.89						
Adjustment for concurrent repairs and material provided to Ogden at no cost		-5.03						
Ogden labor hours:								
Average approved hours for five land-based aircraft				3,069				
Adjustment for personal, fatigue, and delay time				153				
Adjustment for added MCAPP II inspections (Ogden bid)				228				
Adjustment for estimated MCAPP II over and above work				480				
Ogden rate:								
DCAA estimate of actual rate					\$68.83			
Subtotal cost estimate	4,389	\$62.86	\$275,893	3,930	\$68.83	\$270,502	\$5,391	Ogden
Adjustment for equipment for MCAPP II work at Ogden based on 4 contract option years						\$2,379		
Total	4,389	\$62.86	\$275,893	3,930	\$68.83	\$272,881	\$3,012	Ogden

^aExcludes one aircraft the Navy included in its analysis as an MCAPP II that was actually an MCAPP I.

Comparison of North Island and Ogden F/A-18 MCAPP Hours Based on 1995 Data

	North Island		Ogden Air Logistics Center		Difference	Less costly activity
	Aircraft	Average hours	Aircraft	Average hours		
Labor hours:						
Average actual hours for carrier-based aircraft	8	5,408	6	4,704		
Adjustments to hours:						
Added MCAPP II requirements ^a				547		
Component rework differences ^b		-464				
Adjusted labor hours		4,944		5,251		
Rates:						
Actual rate ^c		\$64.56		\$65.97		
Adjusted rate ^d		\$59.04		\$52.98		
Total cost^e						
Estimated cost per MCAPP II based on actual rate		\$319,185		\$348,787	\$29,602	North Island
Estimated cost per MCAPP II based on adjusted rate		\$291,894		\$280,577	\$11,317	Ogden

^a North Island F/A-18s were repaired using the MCAPP II specification and Ogden F/A-18s were repaired using the MCAPP I specification. The adjustment estimates the labor hours needed for Ogden to perform the additional MCAPP II inspections and repair work.

^b The adjustment provides for North Island repairing some components that are provided to Ogden as government-furnished equipment.

^c Rates are the actual rates for completed F/A-18 MCAPPs in fiscal year 1995.

^d The adjustment to North Island's rate reduces the rate to account for concurrent repair of components and other material provided at no cost to Ogden. The adjustment to Ogden's rate reduces the rate to account for extra work (wing drops) performed outside of the normal MCAPP work and to account for the estimated extra cost incurred in dealing with the contract administrator, the Defense Contract Management Command.

^e The total cost estimates were computed by multiplying the adjusted labor hours for each activity by the rate estimates for each activity. For Ogden, \$2,379 was added to each result to account for the cost of equipment needed to perform MCAPP II work. This amount was determined by dividing the cost of the equipment by the minimum aircraft that would be completed during the 4 option years of the contract. The total cost estimates do not include any estimates for additional costs to the government associated with performing work at two locations.